

**What is claimed is:**

1. In a cellular telecommunications network, a method for Mobile Internet Protocol (MIP) registration between a Mobile Node (MN) and a Packet Data Serving Node (PDSN), the method comprising the steps of:

establishing a Point-to-Point Protocol (PPP) connection between the MN  
5 and the PDSN;

responsive to the establishment of the PPP connection, starting a PPP timer set to expire after a predetermined period of time;

attempting an MIP registration of the MN with the PDSN; and

upon detecting an unsuccessful MIP registration of the MN with the  
10 PDSN, keeping alive the PPP connection between the MN and the PDSN until an expiration of the predetermined period of time of the PPP timer;

whereby the MN can attempt at least one additional MIP registration during the predetermined period of time following the unsuccessful MIP registration.

2. The method claimed in claim 1, wherein the step of attempting an MIP registration, i) is performed responsive to a receipt at the MN of an agent advertisement message received from the PDSN, and ii) comprises sending from the MN to the PDSN an MIP registration request.

3. The method claimed in claim 1, wherein the predetermined period of time is comprised in a range of one second to ten minutes.

4. The method claimed in claim 3, wherein the predetermined period of time is comprised in a range of one minute to 5 minutes.

5. The method claimed in claim 1, wherein the step of keeping alive the PPP connection comprises the steps of:

detecting if the MIP registration is successful;

upon detection of an unsuccessful MIP registration, detecting if a new

5 MIP registration request is received by the PDSN from the MN before the expiration of the predetermined period of time; and

if a new MIP registration request is received by the PDSN from the MN before the expiration of the predetermined period of time, resetting the PPP timer to the predetermined period of time.

6. The method claimed in claim 1, further comprising the step of:

terminating the PPP connection if a new MIP registration request is not received by the PDSN from the MN before the expiration of the predetermined period of time.

7. An Internet Protocol-based (IP-based) cellular telecommunications system comprising:

a Mobile Node (MN); and

a Packet Data Serving Node (PDSN) connected to the MN through a

5 Point-to-Point Protocol (PPP) connection;

wherein responsive to an establishment of the PPP connection, the PDSN starts a PPP timer set to expire after a predetermined period of time, and wherein upon detecting an unsuccessful Mobile Internet Protocol (MIP) registration attempt of the MN with the PDSN, the PDSN keeps alive the PPP connection between the MN and the  
10 PDSN until an expiration of the predetermined period of time of the PPP timer.

8. The system claimed in claim 7, wherein the IP-based cellular telecommunications system is a Code Division Multiple Access (CDMA) 2000 cellular telecommunications system.

9. The system claimed in claim 7, wherein:  
the PDSN sends an agent advertisement message to the MN;  
responsive to a receipt at the MN of the agent advertisement message sent  
by the PDSN, the MN sends an MIP registration request message for attempting to  
5 register with the PDSN.

10. The system claimed in claim 7, wherein the predetermined period of time is comprised in the range of one second to ten minutes.

11. The system claimed in claim 7, wherein the predetermined period of time is comprised in the range of one minute to 5 minutes.

12. The system claimed in claim 7, wherein the PDSN:

detects if the MIP registration is successful;

upon detection of an unsuccessful MIP registration, further detects if a new MIP registration request is received from the MN before the expiration of the predetermined period of time; and

if a new MIP registration request is received from the MN before the expiration of the predetermined period of time, resets the PPP timer to the predefined period of time.

13. The system claimed in claim 1, wherein the PDSN terminates the PPP connection if a new MIP registration request is not received from the MN before the expiration of the predetermined period of time.

**14.** A Packet Data Serving Node (PDSN) comprising:

a Point-to-Point Protocol connection (PPP) timer started upon establishment of a PPP connection between the PDSN and a Mobile Node (MN), the PPP timer being set to expire after a predetermined period of time; and

5 a PPP stack enabled upon the establishment of the PPP connection; and

a PDSN/Foreign agent functionality for performing a Mobile Internet Protocol (MIP) registration of the MN with the PDSN;

10 wherein upon detecting an unsuccessful MIP registration attempt of the MN with the PDSN, the PDSN/Foreign agent keeps the PPP stack enabled and the PPP connection alive between the MN and the PDSN until an expiration of the predetermined period of time of the PPP timer.

**15.** The PDSN claimed in claim 14, wherein at least one of the PPP timer, the PPP stack, and the PDSN/Foreign agent are software modules.

**16.** The PDSN claimed in claim 14, wherein at least one of the PPP timer, the PPP stack, and the PDSN/Foreign agent are hardware modules.

**17.** The PDSN claimed in claim 14, wherein at least one of the PPP timer, the PPP stack, and the PDSN/Foreign agent are software modules running on an operating system itself running on top of a hardware platform.

18. The PDSN claimed in claim 14, wherein the PDSN operates in a Code Division Multiple Access (CDMA) 2000 cellular telecommunications system.

19. The PDSN claimed in claim 14, wherein:

the PDSN/Foreign agent sends an agent advertisement message to the MN upon establishment of the PPP connection between the PDSN and the MN; and

responsive to a receipt at the MN of the agent advertisement message, the  
5 MN sends an MIP registration request message for attempting to register with the PDSN/Foreign agent.

20. The PDSN claimed in claim 14, wherein the predetermined period of time is comprised in the range of one second to ten minutes.

21. The PDSN claimed in claim 14, wherein the predetermined period of time is comprised in the range of one minute to 5 minutes.

22. The PDSN claimed in claim 14, wherein the PDSN/Foreign agent:  
detects if the MIP registration is successful;  
upon detection of an unsuccessful MIP registration, detects if a new MIP  
registration request is received from the MN before the expiration of the predetermined  
5 period of time; and  
if a new MIP registration request is received from the MN before the  
expiration of the predetermined period of time, resets the PPP timer to the predefined  
period of time.

23. The PDSN claimed in claim 14, wherein the PDSN/Foreign agent  
terminates the PPP connection if a new MIP registration request is not received from the  
MN before the expiration of the predetermined period of time.

24. In a cellular telecommunications network, a method for Mobile Internet  
Protocol (MIP) registration between a Mobile Node (MN) and a Packet Data Serving  
Node (PDSN), the method comprising the steps of:  
establishing a Point-to-Point Protocol (PPP) connection between the MN  
5 and the PDSN;  
responsive to the establishment of the PPP connection, starting a PPP  
timer set to expire after a predetermined period of time;  
attempting an MIP registration of the MN with the PDSN; and

upon detecting an unsuccessful MIP registration of the MN with the

10 PDSN:

sending from the PDSN to the MN an MIP registration  
reply for informing the MN that the MIP registration was  
unsuccessful;

15 keeping alive the PPP connection between the MN and the  
PDSN until an expiration of the predetermined period of time of  
the PPP timer; and

20 responsive to a receipt of the MIP registration reply at the  
MN, attempting an additional MIP registration of the MN with the  
PDSN by sending an additional MIP registration request from the  
MN to the PDSN, wherein the steps of attempting an MIP  
registration and the step of attempting an additional MIP  
registration comprise sending from the MN to the PDSN an MIP  
registration request.

25. The method claimed in claim 24, wherein the predetermined period of  
time is comprised in a range of one second to ten minutes.

26. The method claimed in claim 25, wherein the predetermined period of  
time is comprised in a range of one minute to 5 minutes.



27. The method claimed in claim 24, wherein the step of keeping alive the PPP connection comprises the steps of:

detecting if the MIP registration is successful;

5 upon detection of an unsuccessful MIP registration, detecting if the additional MIP registration request is received by the PDSN from the MN before the expiration of the predetermined period of time; and

if the additional MIP registration request is received by the PDSN from the MN before the expiration of the predetermined period of time, resetting the PPP timer  
10 to the predetermined period of time.

28. The method claimed in claim 24, further comprising the step of:

terminating the PPP connection if the additional MIP registration request is not received by the PDSN from the MN before the expiration of the predetermined period of time.